



Congruent Triangles

Year 9 Mathematics
Mainstream

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Learning Objectives

By the end of the lesson I hope that you understand and can apply the following to a range of questions from the Year 9 Mathematics course.

- Understand what it means to be congruent
- Be able to understand what it takes for triangles to be congruent
- To be able to identify corresponding pairs of sides or angles in triangles
- To be able to use congruence of triangles to find unknown angles or side lengths



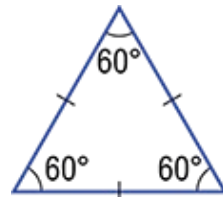
RECAP

We have been dealing with a lot of things in the previous lessons. We have looks at the language used for geometry. We have looked at triangles, quadrilaterals, polygons and parallel lines.

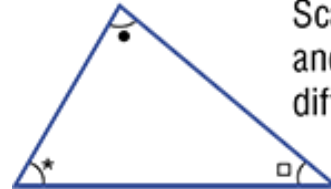
We now move onto the idea of shapes being the same shape and size.

Why would this be important?

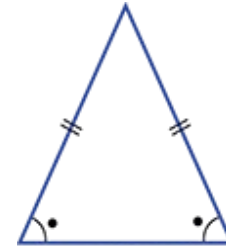
- **Ray:** A straight line which extends from a point to infinity and beyond
- **Line:** A set of points which continue
- **Line Segment:** A section of a straight line
- **Acute angle:** between 0° and 90°
- **Obtuse angle:** between 90° and 180°
- **Right angle:** 90°
- **Straight angle:** 180°
- **Reflex angle:** between 180° and 360°
- **Revolution:** 360°
- **Complementary angles:** Add to 90°
- **Supplementary angles:** Add to 180°



Equilateral (all angles 60° and all sides equal)



Scalene (all sides and angles are different sizes)



Isosceles (two angles equal and two sides equal)

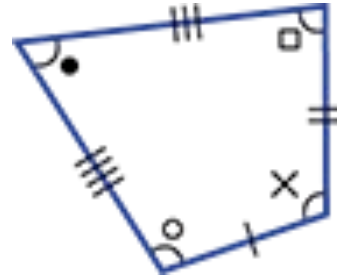
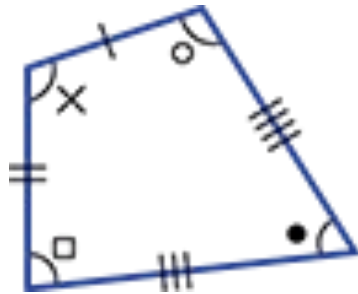
- **Exterior Angle Sum:** All exterior angles of a polygon add to 360°
- **Interior angles sum:** $180(n - 2)$ where n is the number of sides
- **Polygon:** A closed shape made up of straight lines. Regular polygons have all sides and all interior angles the same size.
- **FUZX Rules**



The same size and shape

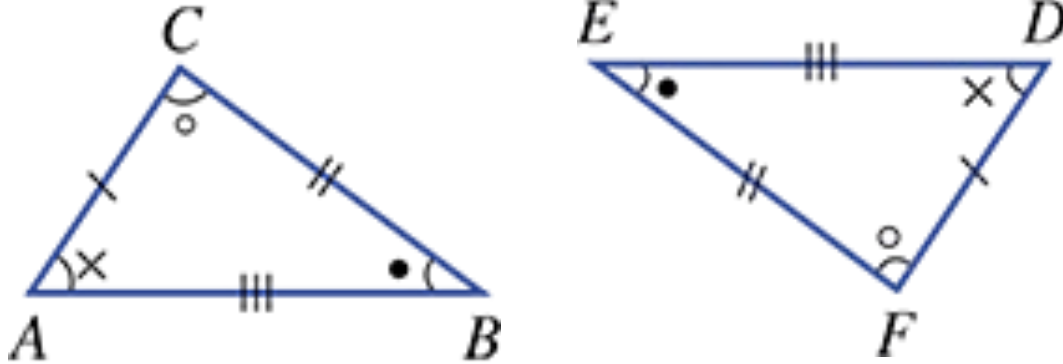
When two figures have the same size and shape, they are said to be **congruent**. This means that the shape has generally been rotated or flipped horizontally or vertically.

The following two shapes are congruent. The second shape is a rotation of the first. Note that the angles are the same size and the sides are the same length.



Corresponding sides and congruence notation

Corresponding sides are opposite corresponding angles. This is pretty important!



$$\triangle DEF \equiv \triangle ABC$$

The notation is really important too.

If the two figures shown above are congruent, we write the following:

$$\triangle DEF \equiv \triangle ABC$$



Tests for congruence

There are three tests we can use to determine congruence. They are:

- Side, side, side (SSS)
- Side, angle, side (SAS)
- Angle, angle, side (AAS)
- Right angle, hypotenuse, side (RHS)

Let's look at each of these in turn.

It is really important that you add these to your summary book and learn them too.

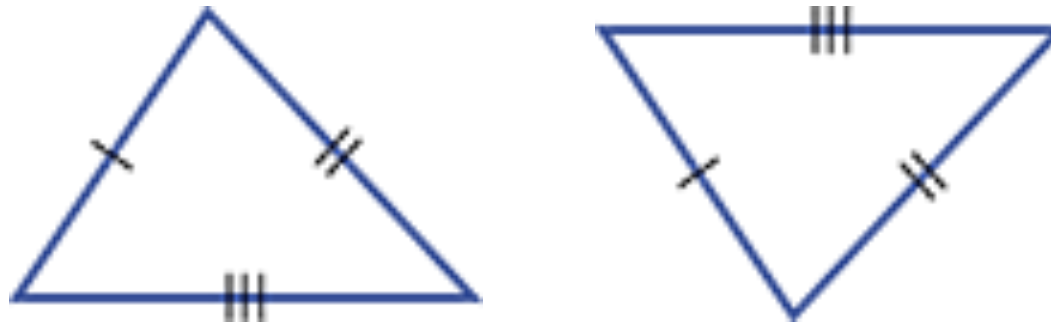


Congruence test: Side, Side, Side (SSS)

When three pairs of corresponding sides are equal then both figures must be congruent.

This makes sense. You cannot draw two figures with the same side lengths but different angles! Hence, the shapes must be the same.

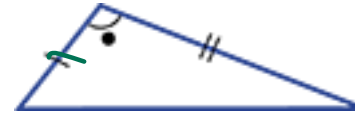
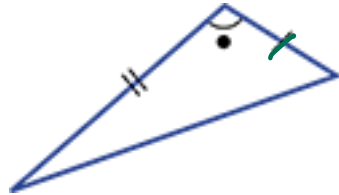
SSS



Congruence test: Side, Angle, Side (SAS)

When two pairs of corresponding sides are the same and the included angle is the same, the figures must be the same.

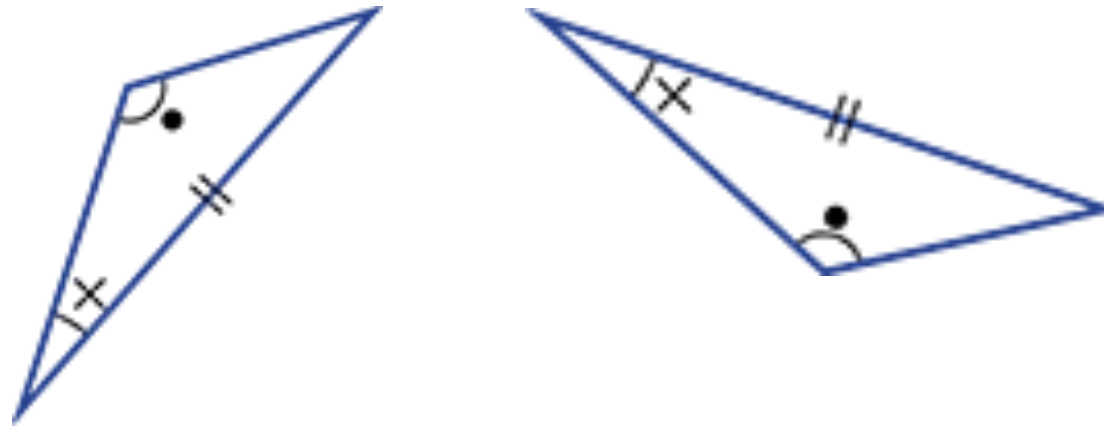
Again, this makes sense. When looking at a triangle, when the sides are the same and the angle is the same, they have to be the same triangle.



Congruence test: Angle, Angle, Side (AAS)

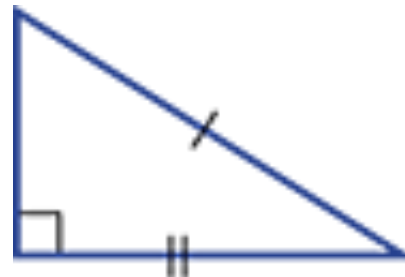
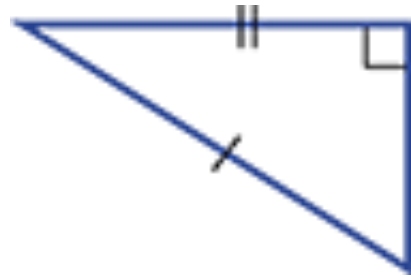
When two angles and any pair of corresponding sides are the same then the figures will be exactly the same.

Again, this makes sense. Whilst there are triangles which can be drawn with the same angles but different side lengths, if we keep one side length the same, then the triangle will have to be drawn the same way.



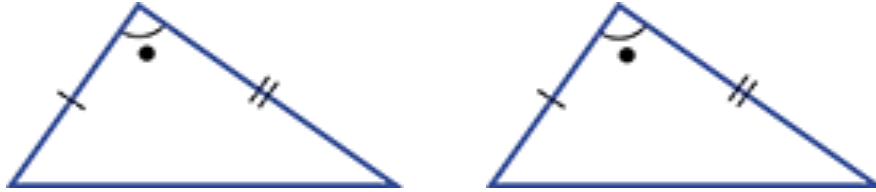
Congruence test: Right angle, Hypotenuse, Side (RHS)

The final test is where a right angle, the hypotenuse and one other pair of corresponding sides are equal. This means the figures must be the same.



Example: Choosing a congruence test

Which congruence test (SSS,SAS,AAS or RHS) would be used to show that these pairs of triangles are congruent?

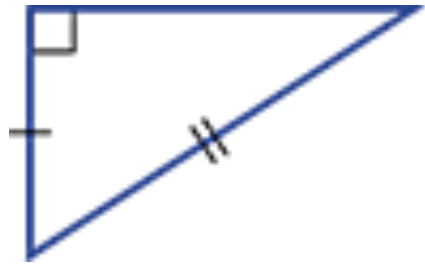
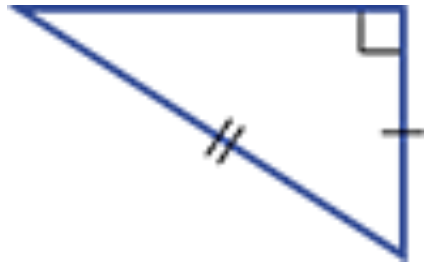


SAS



Example: Choosing a congruence test

Which congruence test (SSS,SAS,AAS or RHS) would be used to show that these pairs of triangles are congruent?

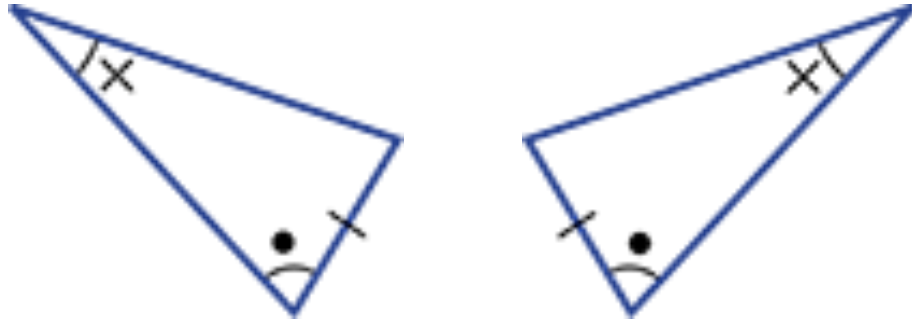


RHS



Example: Choosing a congruence test

Which congruence test (SSS,SAS,AAS or RHS) would be used to show that these pairs of triangles are congruent?

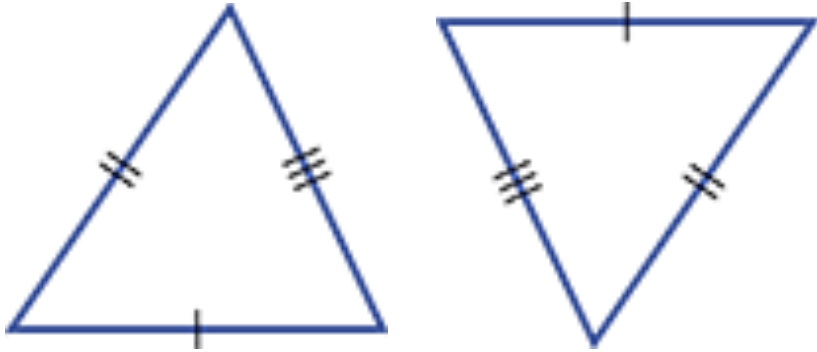


AAS



Example: Choosing a congruence test

Which congruence test (SSS,SAS,AAS or RHS) would be used to show that these pairs of triangles are congruent?

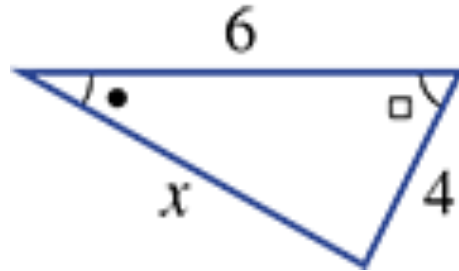
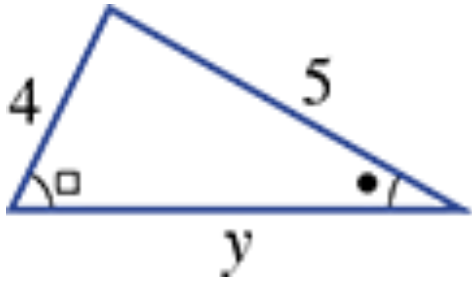


SSS



Example: Finding missing side lengths and angles using congruence

Find the values of the pronumerals in these pairs of congruent triangles.

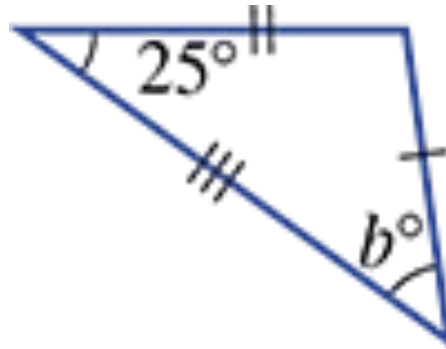
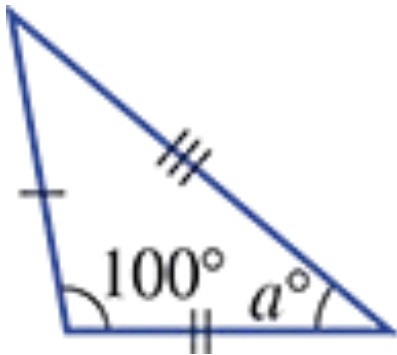


$$x = 5$$
$$y = 6$$



Example: Finding missing side lengths and angles using congruence

Find the values of the pronumerals in these pairs of congruent triangles.



$$a = \underline{\underline{25^\circ}}$$



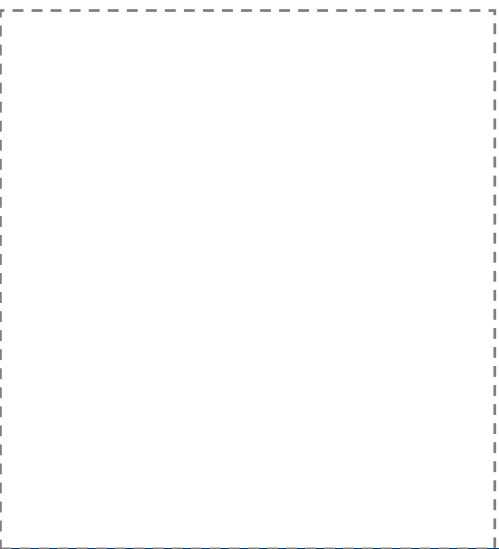
Questions to complete:

The questions I would like you to complete for this lesson are:

Exercise 7D Congruent Triangles

Questions: 1, 2, 3, 4, 5, 7, 8, 10

Extension: None



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